

**AMENDMENTS**

In response to the Office Action, please amend the above-identified application as follows.

**In the Claims:**

1. (original) A navigation system, comprising:

(a) a GPS receiver adapted to receive electromagnetic signals from a plurality of satellites, said GPS having a first output for providing a signal indicative of the position of said GPS receiver;

(b) a magnetometer positionable for measuring one or more components of the earth's magnetic field, said magnetometer having a second output for providing a signal indicative thereof;

(c) an accelerometer for measuring one or more axes of acceleration, said accelerometer having a third output for providing a signal indicative thereof; a

(d) a 3-axes rate gyroscopes for measuring the rate of rotation of the navigational system, said rate gyroscope having a fourth output for providing a signal indicative thereof; and

(e) a computing device having:

(i) a plurality of inputs, at least one input of said plurality of inputs in communication with each of said first, second, third, and fourth outputs; and

(ii) a database of the magnetic fields of the earth.

1 2. (original) The navigation system of claim 1 further comprising one or more barometric  
2 sensors, for measuring atmospheric pressure and providing signals indicative thereof.

1 3. (original) The navigation system of claim 1 wherein said 3-axes rate gyroscope is a  
2 MEMS based rate gyroscope.

1 4. (original) The navigation system of claim 1 further comprising a display means for  
2 visually displaying information from said computing device.

1 5. (original) The navigation system of claim 1 further comprising an aural transducer for  
2 communicating audible information from said computing device.

1 6. (original) The navigation system of claim 1 further comprising a battery wherein the  
2 operating power for the navigation system is supplied by said battery.

1 7. (original) The navigation system of claim 1 further comprising an RF data link  
2 configured for digital communication.

1 8. (original) The navigation system of claim 1 further comprising nonvolatile memory for  
2 storing flight navigational information.

1 9. (original) The navigation system of claim 1 further comprising an interface for  
2 communicating with avionic systems of an aircraft.

1 10. (original) The navigation system of claim 1 further comprising a sensor for  
2 determining the braking status of a vehicle when the system is installed in said vehicle.

1 11. (original) The navigation system of claim 1 further comprising a sensor for  
2 determining the position of a throttle in a vehicle when the system is installed in said  
3 vehicle.

1 12. (original) The navigation system of claim 1 wherein the navigation system is  
2 configured for portable operation.

1 13. (original) The navigation system of claim 4 wherein said display shows at least one  
2 of the navigational components selected from the group consisting of:

3 (a) position;

4 (b) heading;

5 (c) velocity;

6 (d) acceleration;

7 (e) pitch;

8 (f) roll; and

9 (g) track angle.

1 14. (original) The navigation system of claim 1 wherein said computing device  
2 includes a Kalman filter and wherein said first, second, third, and fourth outputs provide  
3 inputs to said Kalman filter.

15. (Previously Cancelled)

1 16. (original) The navigation system of claim 1 wherein said computing device includes  
2 database information selected from the group consisting of:

- 3 (a) 2-D map information;
- 4 (b) topographical information; and
- 5 (c) oceanographic information,

1 17. (original) The navigation system of claim 1 further comprising a memory card.

1 18. (currently amended) The navigation system of claim 17 further including at least one  
2 protectant for said memory card selected from the group consisting of:

- 3 (a) ~~inertial~~ impact absorbing material;
- 4 (b) heat insulating material; and
- 5 (c) corrosion resistant conformal coating.

1 19. (original) A navigation system, comprising:

2 a Global Positioning Sensor receiver adapted to receive electromagnetic  
3 signals from a plurality of satellites to determine a position, said Global  
4 Positioning Sensor receiver having a first output for providing a signal indicative  
5 said position;

6 an accelerometer for measuring one or more independent components of  
7 acceleration, said accelerometer having a second output for providing a signal  
8 indicative of said one or more independent components of acceleration;

9 a rate gyroscope for measuring three independent components of rate of  
10 rotation, said rate gyroscope having a third output for providing a signal indicative  
11 of said three independent components of rate of rotation;

12 a computing device having a plurality of inputs for in communication with  
13 said first, second, and third outputs; and

14 a housing wherein is housed said Global Positioning Sensor receiver, said  
15 accelerometer, and said rate gyroscope, wherein said housing is configured such  
16 that the navigation system is portable.

1 20. (original) The navigation system of claim 19 wherein said rate gyroscopes are MEMS  
2 based.

1 21. (original) The navigation system of claim 19 further comprising a barometric sensor  
2 for measuring the altitude of the navigation system.

1 22. (original) The navigation system of claim 19 further comprising a display for visually  
2 displaying navigation information to an operator.

1 23. (original) The navigation system of claim 19 further comprising an audio transducer  
2 for providing information aurally to an operator.

1 24. (original) The navigation system of claim 19 further comprising a battery housed in  
2 said housing for providing electrical power for the operation of the navigation system.

1 25. (original) The navigation system of claim 19 further comprising a data link for  
2 communicating with other navigation systems.

1 26. (original) The navigation system of claim 19 further comprising a memory card  
2 readable and writable by said computing device.

1 27. (original) The navigation system of claim 19 portable for use on a craft, further  
2 including a braking system sensor for measuring a braking force of the craft.

1 28. (original) The navigation system of claim 19 portable for use on a craft, further  
2 including a throttle position sensor for measuring a throttle position of the craft.

1 29. (currently amended) The navigation system of claim 19 portable for use on a craft,  
2 further including a tamper ~~determining means~~ sensing circuitry to detect tampering with  
3 the craft.

1 30. (original) The navigation system of claim 29 further comprising a keypad for  
2 inputting navigational information to said computing device and for inputting a code to  
3 distinguish legitimate use of the craft from tampering.

1 31. (original) The navigation system of claim 22 wherein said display can be configured  
2 to display at least one navigational parameter selected from the group consisting of:

- 3 (a) the track of a vehicle;
- 4 (b) the heading of the vehicle;
- 5 (c) the velocity of the vehicle;
- 6 (d) the acceleration of the vehicle;
- 7 (e) the pitch and roll of the vehicle; and
- 8 (f) the braking status of the vehicle.

1 32. (original) The navigation system of claim 19 wherein said computing device  
2 processes the signals from said first, second, and third outputs through a Kalman filter.

33. (Previously Cancelled)

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53. (Previously Cancelled)
- 1 54. (Previously Cancelled)
- 1 55. (original) A low-cost navigation system comprising:



2 a magnetometer for measuring one or more independent components of the earth's  
3 magnetic field, said magnetometer having an output providing a signal indicative of the  
4 earth's magnetic field; and

5 a means for inputting a position on the earth's surface; and

6 a computing device comprising:

7 an input for receiving said output; and

8 a database of the earth's magnetic field,

9 wherein the attitude of navigation system may be determined by comparing said position,  
10 and the direction of the earth's magnetic field, with information contained in said  
11 database.

12  
13 56. (original) The low-cost navigation system of claim 55 wherein said means for  
14 inputting a position on the earth's surface comprises a GPS receiver for determining the  
15 position of the navigation system and wherein said database is structured such that the  
16 stored direction of the earth's magnetic field is arranged relative to discrete positions on  
17 the earth's surface.

18  
19 57. (Previously Cancelled)

20 58. (Previously Cancelled)

21 59. (Previously Cancelled)